# Hybrid Digital Workflow to Fabricate Patient Specific 3D Printed Teeth with a PMMA Base- A Laboratory Technique

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## Objective:

Immediate interim dentures for the treatment of hopeless dentition are a common treatment modality. While 3D printed dentures have become a reality, they still have limitations compared to tried and true PMMA technology, namely dependable and predictable immediate relining potential. Artificial denture teeth can be an inadequate representation of natural teeth in rehabilitations opposing natural dentition. Described below is a technique to meld customized 3D printed teeth with a conventional PMMA denture base.

Fig.1 Preoperative Diagnostic photograph

Fig.2 Preoperative Diagnostic Models

Fig.3 Mounted Diagnostic Wax up models

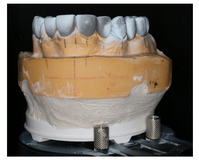


Fig.4 Model being scanned on scan platform using a lab scanner (Zfx Scan III)

## Methods:

Mounted diagnostic casts were obtained at the planned VDO (Fig.2). Diagnostic wax up of the planned tooth position, size and occlusion was completed (Fig.3) and scanned with a lab scanner (Zfx Scan III) to generate an .stl file of a digital model (Fig.4).

A facebow preservation record was made to record the tooth position (Fig.5) and a duplicated wax up model was mounted and the teeth were trimmed. The diagnostic set up was split as a splinted monolithic unit from the model using 3D modeling software (Autodesk Meshmixer), and exported to a 3D printer (Formlabs Form 2) and printed using Denture teeth resin (NextDent) and processed based on manufacturer's instructions (Figs. 6,7,8).

Fig.5 Facebow preservation record. Diatorics drilled on the intaglio of the printed teeth.

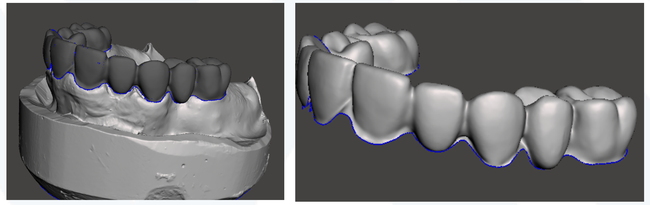


Fig.6 Generating a monolithic splinted unit of the teeth using Meshmixer.

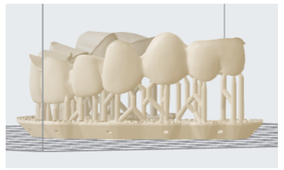


Fig.7 .stl file of the teeth ready to be 3D printed

Fig.8 3D printed teeth post processing

Fig.9 3D printed teeth in the waxed denture base.

Diatoric holes were drilled on the intaglio of the 3D printed teeth to maximize mechanical retention (Fig.5). The printed teeth were related to the altered cast using the previously fabricated facebow record and the trial denture base was waxed using baseplate wax.

The waxed denture was traditionally processed using an injection molding technique with high impact resin in an Ivobase (Ivoclar Vivadent, Fig.10). The printed teeth were stained and glazed using Optiglaze (Fig.11).

Fig.10 Processing of the Denture using the injection molding technique

Fig.11 Maxillary denture post application of stain and glaze

## Conclusions:

The technique affords the ability to utilize patient specific denture teeth with the ease of PMMA relining materials and allowing straightforward future implant planning using appropriately sized and shaped teeth for the patient's esthetic demands (Fig.12,13 and 14).

Fig.12 Post Insertion with soft tissue conditioning

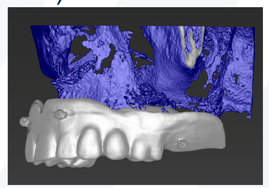
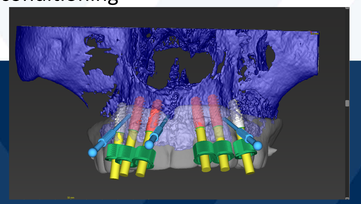


Fig.13 3D render of the denture on the implant planning software.



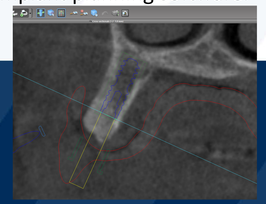


Fig.14. Implant planning using patient specific teeth

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